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FECAL EXAMINATIONS OF A REGIMENT INFECTED WITH BACILLUS PARATYPHOSUS A, WITH SPECIAL REFERENCE TO NORMAL CARRIERS *

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The Fourteenth Infantry, N. G. N. Y., returned last fall from the Mexican border badly infected with paratyphoid (A type). Dr. Charles W. Berry has reported the epidemiology of this outbreak.[1] The onset of paratyphoid fever was foreshadowed and accompanied by many cases of enteritis with diarrhea. As fas as we know, however, Bacillus paratyphosus A, in contrast to other members of the paratyphoid-enteritidis group, does not cause acute enteritis; paratyphoid A infections, clinically and epidemiologically, are closely allied to typhoid fever. The close resemblance of this outbreak to water-borne typhoid epidemics, which are frequently accompanied by outbreaks of diarrhea, indicates strongly that it was water-borne.

In all, about 215 cases were diagnosed among 1000 men; the total incidence of the disease was probably higher. Because of this high incidence, a general fecal examination was undertaken after the return of the regiment to the New York armory, preliminary to discharge. Altogether, 843 men were examined; this paper presents an analysis of the results of these examinations. The specimens were collected under the supervision of Captain Dr. Charles W. Berry, who also supplied the histories. Special cases were investigated further by Dr. E. F. Marsh. The bacteriologic examinations were made by Ann Kuttner, Elsie Schumm, and Margaret Kelley; the final identification of the strain isolated was made by Lawrence A. Kohn.

The number of cases examined is too few to establish the incidence of excretion of bacilli at different periods after infection, but the results are suggestive. The percentage of positive findings during the first week is much higher than in typhoid fever. During the second week, it about equals the highest percentage (53%) which has been recorded

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[1] Med. Rec., New York, 1917, 91, p. 135.

for typhoid (Gaeghtens and Brüchner[2]). In the third and fourth weeks, the percentage falls, whereas all investigators have found an increased excretion after the first week of typhoid fever which reaches its height, as a rule, during the third week. This marked difference is probably correlated with differences in the intensity and extent of intestinal lesions in the two diseases and not accidental, due to the small number of cases examined. It has been possible to repeat the examinations on only a few of these men, so that I can give no data on the incidence of chronic convalescent carriers. As individual case histories are not available, the results cannot be analyzed in relation to the time of disappearance of the fever, and as the duration and intensity of the disease varied so considerably, an average febrile period cannot be used. Besides the cases tabulated, one man with positive fecal results developed a pyonephrosis 12 days later. He had not been ill previously and, unfortunately, it was not possible to determine whether this condition was due to a renal localization of B. paratyphosus A.

TABLE 1

RESULT OF EXAMINATION; CASES OF PARATYPHOID FEVER

Time of Examination	Examined (No.)	Positive (Per Cent.)
Incubation (period of one week before onset)	13	15
At onset or during first week	6	83
During second week	2	50
During third week	9	33
During fourth week	10	20
During fifth week	12	15
During sixth and seventh week	5	20

Exclusive of the cases cited, there remains a total of 786 men. Of these, 32, or 4%, gave positive fecal results. Twenty-one were re-examined 10 to 12 days later and 9 were again positive. The histories of these men were carefully investigated, and no record of illness before or after the time of examination was found. Although the absence of any history of illness is not conclusive evidence that none of them had had mild transient symptoms, it is fairly conclusive for the following reasons: At the border the camp conditions were rigorous and the temperature high, and the added strain of drills and forced marches makes it unlikely that any man who was even slightly ill would not have reported to the medical officer. The men were from urban life and occupations, and were not hardened to the strain of actual field service. As soon as the presence of a febrile epidemic was recognized, the medical supervision became rigid, and a general thermometer inspection was instituted. After the return of the regiment it is unlikely that any illness would have been overlooked, as the men were closely observed until the time of discharge. Subsequent to discharge, which took place after all the fecal examinations were completed, no case of illness was reported in this group of men.

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[2] Cited by Ledingham and Arkwright, The Carrier Problem in Infectious Diseases, 1912, p. 10.

It therefore seems justifiable to put these men in the class of normal carriers, that is, in the group of intestinal carriers who without evidence of disease, harbor and excrete bacilli for a variable, but usually short, length of time. As such, the percentage (4%) is very high. Doubtless, it is directly proportional to the high degree of exposure to infection and to the relatively low virulence of the infecting type, which, in spite of intestinal multiplication, did not go on to general invasion. It is hardly necessary to emphasize the important rôle these men would have played in the spread of infection had they remained unrecognized, which would have been the case had general fecal examinations not been instituted.

The methods employed in the examinations were the use of brilliant-green agar previously reported,[3] the tentative agglutination from the plate by the macroscopic slide method, using a paratyphoid A serum, and the isolation of positive colonies with the Russell medium, followed by final cultural and agglutinative identification. None of the strains isolated fermented xylose, and all were agglutinated by the type serum. As a strain isolated from a member of this regiment was at our disposal at the beginning of the investigations, the brilliant-green medium was standardized directly against the infecting organism. From 0.35 to 0.5 c.c. of a 0.1% solution of brilliant green to 100 c.c. of agar gave good results, the amount applicable varying with different batches of agar. Because of the relatively marked resistance of the type and the large volume of work, only one strength of dye was used, and the high concentration of brilliant green made heavy inoculation possible. Two dye and 2 Endo plates were used for nearly all samples. The comparative results, where recorded, were: dye agar, 48 positive, and Endo plates, 25 positive, or 52% of total positive findings. Undoubtedly, more elaborate technic would have increased, to some extent, the total number of positive findings.

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[3] Krumwiede, Pratt and McWilliams, Jour. Infect. Dis., 1916, 18 p. 1.

SUMMARY

Examination of the stools of 57 men with paratyphoid fever gave the highest percentage of positive results (83%) during the first week of the disease.

In a series of 786 men exposed to infection, 4% of carriers of B. paratyphosus A had no history of a paratyphoid infection and may be classed as normal carriers. The duration of this condition was probably short in most instances.

The use of a selective plating medium for isolation resulted in a marked increase in positive results.